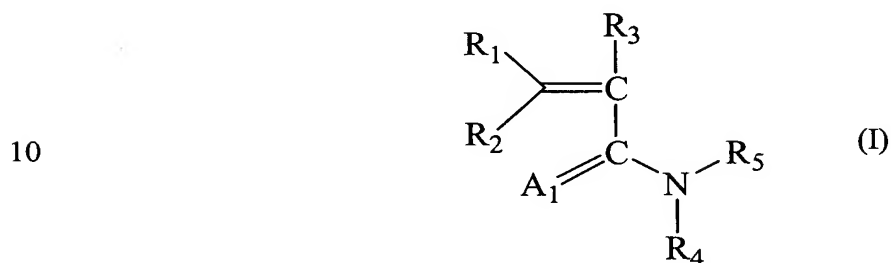


What is claimed is:

1. A composition comprising a buffer and an effective amount of a poly(M₁-g-M₂) or a salt thereof, wherein:

5 (a) each M₁ has the formula (I):



15 wherein each A₁ is independently O, S or NX₁;

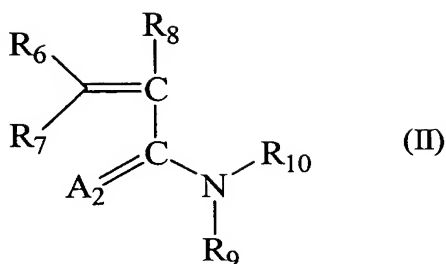
each of R₁, R₂, R₃ and R₄ is independently H, C₁-C₂₀ alkyl, C₄-C₁₂ cycloalkyl, C₅-C₁₂ aryl, C₄-C₁₂ heteroaryl, -(C₁-C₂₀ alkyl)(C₅-C₁₂ aryl) or -(C₅-C₁₂ aryl)(C₁-C₂₀ alkyl);

20 each R₅ is independently C₁-C₂₀ alkyl, C₁-C₂₀ heteroalkyl, C₄-C₁₂ cycloalkyl, C₄-C₁₂ heterocycloalkyl, C₅-C₁₂ aryl, C₄-C₁₂ heteroaryl, -(C₁-C₂₀ alkyl)(C₄-C₁₂ cycloalkyl), -(C₄-C₁₂ cycloalkyl)(C₁-C₂₀ alkyl), -(C₁-C₂₀ heteroalkyl)(C₄-C₁₂ cycloalkyl), -(C₄-C₁₂ cycloalkyl)(C₁-C₂₀ heteroalkyl), -(C₁-C₂₀ alkyl)(C₄-C₁₂ heterocycloalkyl), -(C₄-C₁₂ heterocycloalkyl)(C₁-C₂₀ alkyl), -(C₁-C₂₀ heteroalkyl)(C₄-C₁₂ heterocycloalkyl), -(C₄-C₁₂ heterocycloalkyl)(C₁-C₂₀ heteroalkyl), -(C₁-C₂₀ alkyl)(C₅-C₁₂ aryl), -(C₅-C₁₂ aryl)(C₁-C₂₀ alkyl), -(C₁-C₂₀ heteroalkyl)(C₅-C₁₂ aryl), -(C₅-C₁₂ aryl)(C₁-C₂₀ heteroalkyl), -(C₁-C₂₀ alkyl)(C₄-C₁₂ heteroaryl), -(C₄-C₁₂ heteroaryl)(C₁-C₂₀ alkyl), -(C₁-C₂₀ heteroalkyl)(C₄-C₁₂ heteroaryl), -(C₄-C₁₂ heteroaryl)(C₁-C₂₀ heteroalkyl), -(C₁-C₄ alkyl)_qNH₂, -(C₁-C₄ alkyl)_qCONH₂, -(C₁-C₄ alkyl)NHCONH₂, -(C₁-C₄ alkyl)NHCOH or -(C₁-C₄ alkyl)_qNHCOCH₃, where each q is 0 or 1; and

30 each X₁ is independently H, C₁-C₂₀ alkyl, C₄-C₁₂ cycloalkyl, C₅-C₁₂ aryl, C₄-C₁₂ heteroaryl, -(C₁-C₂₀ alkyl)(C₅-C₁₂ aryl), -(C₅-C₁₂ aryl)(C₁-C₂₀ alkyl), -(C₁-C₄ alkyl)_qNH₂, -(C₁-C₄ alkyl)_qCONH₂, -(C₁-C₄ alkyl)NHCONH₂, -(C₁-C₄ alkyl)_qNHCOH or -(C₁-C₄ alkyl)_qNHCOCH₃, where each q is 0 or 1;

35 (b) each M₂ has the formula (II):

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wherein each A₂ is independently O, S or NX₂;

each of R₆, R₇, R₈ and R₉ is independently H, C₁-C₂₀ alkyl, C₄-C₁₂ cycloalkyl, C₅-C₁₂ aryl, C₄-C₁₂ heteroaryl, -(C₁-C₂₀ alkyl)(C₅-C₁₂ aryl) or -(C₅-C₁₂ aryl)(C₁-C₂₀ alkyl);

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each R₁₀ is independently H, C₁-C₂₀ alkyl, C₁-C₂₀ heteroalkyl, C₄-C₁₂ cycloalkyl, C₄-C₁₂ heterocycloalkyl, C₅-C₁₂ aryl, C₄-C₁₂ heteroaryl, -(C₁-C₂₀ alkyl)(C₄-C₁₂ cycloalkyl), -(C₄-C₁₂ cycloalkyl)(C₁-C₂₀ alkyl), -(C₁-C₂₀ heteroalkyl)(C₄-C₁₂ cycloalkyl), -(C₄-C₁₂ cycloalkyl)(C₁-C₂₀ heteroalkyl), -(C₁-C₂₀ alkyl)(C₄-C₁₂ heterocycloalkyl), -(C₄-C₁₂ heterocycloalkyl)(C₁-C₂₀ alkyl), -(C₁-C₂₀ heteroalkyl)(C₄-C₁₂ heterocycloalkyl), -(C₄-C₁₂ heterocycloalkyl)(C₁-C₂₀ heteroalkyl), -(C₁-C₂₀ alkyl)(C₅-C₁₂ aryl), -(C₅-C₁₂ aryl)(C₁-C₂₀ alkyl), -(C₁-C₂₀ heteroalkyl)(C₅-C₁₂ aryl), -(C₅-C₁₂ aryl)(C₁-C₂₀ heteroalkyl), -(C₁-C₂₀ alkyl)(C₄-C₁₂ heteroaryl), -(C₄-C₁₂ heteroaryl)(C₁-C₂₀ alkyl), -(C₁-C₂₀ heteroalkyl)(C₄-C₁₂ heteroaryl), -(C₄-C₁₂ heteroaryl)(C₁-C₂₀ heteroalkyl), -(C₁-C₄ alkyl)_qNH₂, -(C₁-C₄ alkyl)_qCONH₂, -(C₁-C₄ alkyl)NHCONH₂, -(C₁-C₄ alkyl)NHCOH or -(C₁-C₄ alkyl)_qNHCOCH₃, where each q is 0 or 1; and

20

each X₂ is independently H, C₁-C₂₀ alkyl, C₄-C₁₂ cycloalkyl, C₅-C₁₂ aryl, C₄-C₁₂ heteroaryl, -(C₁-C₂₀ alkyl)(C₅-C₁₂ aryl), -(C₅-C₁₂ aryl)(C₁-C₂₀ alkyl), -(C₁-C₄ alkyl)_qNH₂, -(C₁-C₄ alkyl)_qCONH₂, -(C₁-C₄ alkyl)NHCONH₂, -(C₁-C₄ alkyl)_qNHCOH or -(C₁-C₄ alkyl)_qNHCOCH₃, where each q is 0 or 1;

25

(c) provided that at least one M₁ is different from at least one M₂.

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2. The composition of claim 1, which further comprises a sieve polymer, or a salt thereof, having a monomer unit that is acrylamide, *N*-acetyl-acrylamide, *N*-2-cyanoethyl-acrylamide, *N,N*-1,2-dihydroxyethylene-*bis*-acrylamide, *N*-4,4-dimethoxybutyl-acrylamide, *N*-2,2-dimethoxyethyl-acrylamide, *N,N*-dimethyl-acrylamide, *N*-2-glycolic acid methyl ester acrylamide, *N*-2-hydroxyethyl-acrylamide,

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N-hydroxymethyl-acrylamide, *N*-methoxymethyl-acrylamide, *N*-3-methoxypropyl-acrylamide, *N*-methyl-acrylamide, *N*-methyl-, *N*-2,2-dimethoxyethyl-acrylamide, *N*-morpholinoethyl-acrylamide, *N*-2,2,2-trichloro-1-hydroxyethyl-acrylamide, *N*-tri(hydroxymethyl)-methyl-acrylamide, methacrylamide, *N*-acetyl-methacrylamide, *N*-2-cyanoethyl-methacrylamide, *N,N*-1,2-dihydroxyethylene-*bis*-methacrylamide, *N*-4,4-dimethoxybutyl-methacrylamide, *N*-2,2-dimethoxyethyl-methacrylamide, *N,N*-dimethyl-methacrylamide, *N*-2-glycolic acid methyl ester methacrylamide, *N*-2-hydroxyethyl-methacrylamide, *N*-hydroxymethyl-methacrylamide, *N*-methoxymethyl-methacrylamide, *N*-3-methoxypropyl-methacrylamide, *N*-methyl-methacrylamide, *N*-methyl-, *N*-2,2-dimethoxyethyl-methacrylamide, *N*-morpholinoethyl-methacrylamide, *N*-2,2,2-trichloro-1-hydroxyethyl-methacrylamide, *N*-tri(hydroxymethyl)-methyl-methacrylamide, or a mixture thereof.

3. The composition of claim 2, wherein the sieve polymer is poly(acrylamide).

4. The composition of claim 2, wherein the sieve polymer is poly(*N,N*-dimethyl-acrylamide) and the sieve polymer has a weight-average molecular weight of at least about 3 MDaltons.

5. A method for making poly(*N,N*-dimethylacrylamide), the method comprising polymerizing *N,N*-dimethylacrylamide in an inverse emulsion comprising an oil phase, an aqueous phase, a surfactant and an initiator to provide the poly(*N,N*-dimethylacrylamide), wherein the poly(*N,N*-dimethylacrylamide) has a weight-average molecular weight of at least about 3 MDaltons.

6. The method of claim 5, wherein the oil phase comprises an aliphatic hydrocarbon having at least about 15 carbon atoms, an aliphatic hydrocarbon having a normal boiling point at or above about 270°C, a silicone oil, a fluorinated hydrocarbon, a liquid perfluoropolyether, or a mixture thereof.

7. The poly(*N,N*-dimethylacrylamide) product of the method of claim 5.

8. The composition of claim 1, which further comprises poly(hydroxymethylene), poly(oxyethylene), poly(oxypropylene), poly(oxyethylene-co-oxypropylene), poly(vinyl alcohol), poly(vinylpyrrolidone), poly(2-ethyl-2-oxazoline), poly(2-methyl-2-oxazoline), poly((2-ethyl-2-oxazoline)-co-(2-methyl-2-oxazoline)),
5 poly(*N*-acetamidoacrylamide), poly(acryloxylurea), hydroxyethyl cellulose, hydroxymethyl cellulose, or a mixture thereof.

9. The composition of claim 1, wherein the poly(M₁-g-M₂) or a salt thereof has a weight-average molecular weight of from about 150,000 Daltons to about 20
10 MDaltons.

10. The composition of claim 9, which further comprises a sieve polymer or a salt thereof having a weight-average molecular weight of from about 100,000 Daltons to about 5 MDaltons.

11. The composition of claim 10, wherein the sieve polymer is substantially linear poly(acrylamide).

12. The composition of claim 1, wherein M₁ is:
20 *N*-adamantyl-acrylamide, *N*-butoxymethyl-acrylamide, *N*-butyl-acrylamide, *N*-cyclohexyl-acrylamide, *N,N*-dibutyl-acrylamide, *N*-3-di(butyl)aminopropyl-acrylamide, *N,N*-diethyl-acrylamide, *N*-4,4-dimethoxybutyl-acrylamide, *N,N*-dimethyl-acrylamide, *N*-3-(dimethylamino)-propyl-acrylamide, *N,N*-dipropyl-acrylamide, *N*-dodecyl-acrylamide, *N*-2-ethylhexyl-acrylamide, *N*-isobornyl-acrylamide, *N*-methyl-acrylamide, *N*-methyl-, *N*-2,2-dimethoxyethyl-acrylamide, *N*-morpholinoethyl-acrylamide, *N*-octadecyl-acrylamide, *N*-propyl-acrylamide, *N*-3-(trimethylammonium)-propyl-acrylamide chloride, *N*-1,1,3-trimethylbutyl-acrylamide, *N*-adamantyl-methacrylamide, *N*-butoxymethyl-methacrylamide, *N*-butyl-methacrylamide, *N*-cyclohexyl-methacrylamide, *N,N*-dibutyl-methacrylamide, *N*-3-di(butyl)aminopropyl-methacrylamide, *N,N*-diethyl-methacrylamide, *N*-4,4-dimethoxybutyl-methacrylamide, *N,N*-dimethyl-methacrylamide, *N*-3-(dimethylamino)-propyl-methacrylamide, *N,N*-dipropyl-methacrylamide, *N*-dodecyl-methacrylamide, *N*-2-ethylhexyl-methacrylamide, *N*-isobornyl-methacrylamide, *N*-methyl-methacrylamide, *N*-methyl-, *N*-2,2-dimethoxyethyl-methacrylamide, *N*-morpholinoethyl-methacrylamide, *N*-octadecyl-methacrylamide, *N*-propyl-methacrylamide, *N*-3-

(trimethylammonium)-propyl-methacrylamide chloride, *N*-1,1,3-trimethylbutyl-methacrylamide, or a mixture thereof.

13. The composition of claim 12, wherein M_2 is:

5 acrylamide, *N*-acetyl-acrylamide, *N*-butoxymethyl-acrylamide, *N*-4,4-dimethoxybutyl-acrylamide, *N*-2,2-dimethoxyethyl-acrylamide, *N*-2-glycolic acid methyl ester acrylamide, *N*-2-hydroxyethyl-acrylamide, *N*-hydroxymethyl-acrylamide, *N*-methoxymethyl-acrylamide, *N*-3-methoxypropyl-acrylamide, *N*-methyl-acrylamide, *N*-methyl-, *N*-2,2-dimethoxyethyl-acrylamide, *N*-morpholinoethyl-acrylamide,
10 *N*-2,2,2-trichloro-1-hydroxyethyl-acrylamide, *N*-tri(hydroxymethyl)-methyl-acrylamide, methacrylamide, *N*-acetyl-methacrylamide, *N*-butoxymethyl-methacrylamide, *N*-4,4-dimethoxybutyl-methacrylamide, *N*-2,2-dimethoxyethyl-methacrylamide, *N*-2-glycolic acid methyl ester methacrylamide, *N*-2-hydroxyethyl-methacrylamide, *N*-hydroxymethyl-methacrylamide, *N*-methoxymethyl-methacrylamide,
15 *N*-3-methoxypropyl-methacrylamide, *N*-methyl-methacrylamide, *N*-methyl-, *N*-2,2-dimethoxyethyl-methacrylamide, *N*-morpholinoethyl-methacrylamide, *N*-2,2,2-trichloro-1-hydroxyethyl-methacrylamide, *N*-tri(hydroxymethyl)-methyl-methacrylamide, or a mixture thereof.

20 14. The composition of claim 12, wherein M_2 is:

N-acetyl-acrylamide, *N*-butoxymethyl-acrylamide, *N*-4,4-dimethoxybutyl-acrylamide, *N*-2,2-dimethoxyethyl-acrylamide, *N*-2-glycolic acid methyl ester acrylamide, *N*-2-hydroxyethyl-acrylamide, *N*-hydroxymethyl-acrylamide, *N*-methoxymethyl-acrylamide, *N*-3-methoxypropyl-acrylamide, *N*-methyl-acrylamide,
25 *N*-methyl-, *N*-2,2-dimethoxyethyl-acrylamide, *N*-morpholinoethyl-acrylamide, *N*-2,2,2-trichloro-1-hydroxyethyl-acrylamide, *N*-tri(hydroxymethyl)-methyl-acrylamide, *N*-acetyl-methacrylamide, *N*-butoxymethyl-methacrylamide, *N*-4,4-dimethoxybutyl-methacrylamide, *N*-2,2-dimethoxyethyl-methacrylamide, *N*-2-glycolic acid methyl ester methacrylamide, *N*-2-hydroxyethyl-methacrylamide, *N*-hydroxymethyl-methacrylamide, *N*-methoxymethyl-methacrylamide, *N*-3-methoxypropyl-methacrylamide, *N*-methyl-methacrylamide, *N*-methyl-, *N*-2,2-dimethoxyethyl-methacrylamide, *N*-morpholinoethyl-methacrylamide, *N*-2,2,2-trichloro-1-hydroxyethyl-methacrylamide, *N*-tri(hydroxymethyl)-methyl-methacrylamide, or a mixture thereof.

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15. The composition of claim 1, wherein the buffer is an aqueous buffer.
16. The composition of claim 15, wherein the composition has a pH of from about 5 to about 11.
- 5 17. The composition of claim 15, wherein the composition has a pH of from about 7 to about 10.
- 10 18. The composition of claim 15, wherein M_1 is *N,N*-dimethylacrylamide and M_2 is acrylamide.
- 15 19. The composition of claim 16, further comprising formamide, urea, pyrrolidone, *N*-methyl pyrrolidone or a mixture thereof.
- 20 20. The composition of claim 16, further comprising urea.
21. The composition of claim 16, further comprising formamide.
22. A capillary containing the composition of claim 1.
23. The capillary of claim 22, wherein the capillary is a capillary tube.
24. A method for separating a mixture of biomolecules, comprising:
(a) contacting the composition of claim 1 with a mixture comprising a biomolecule;
25 and
(b) applying an electric field to the composition in an amount sufficient to facilitate the separation of a biomolecule from the mixture.
- 30 25. The method of claim 24, wherein the separation is performed within a capillary tube and two or more biomolecules are polynucleotides.
- 35 26. The method of claim 25, wherein the separation has a crossover of at least 400 base pairs.

27. Poly(*N,N*-dimethylacrylamide) having a weight-average molecular weight of at least about 3 MDaltons.

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